MTS/NAV 2020
FOCUS AREA 1

Innovative Infrastructure and System Enhancements

TEAM MEMBERS

- Stan Woodson, GSL (Leader)
- Bob Mann, TEC
- Joe Padula, ITL
- Bob Ebeling, ITL
- Jim McDonald, GSL
- Ed Thompson, CHL
- Harold Britton, TEC
- Richard Stockstill, CHL, CRREL
- Terri Prickett, CHL (Recorder)

OBJECTIVES/GOALS

- Reduce life cycle maintenance costs
- Improve transportation efficiency
- Minimize construction time, reduce risks, and minimize impacts to navigation and the environment
- Integrate national security requirements into the MTS

GENERAL APPROACH

- Determination and assessment of current capacity and future industry needs
- Laboratory research, field tests and demonstrations, tech transfer and insertion (implementation)

PRIMARY PRODUCTS

1. Technology for underwater construction, inspection, monitoring, repair, and maintenance

2. Technology for design, construction, maintenance, and repair of navigation structures

3. Technology for improving transportation operational efficiency

PRIMARY PRODUCT 1

- Technology for underwater construction, inspection, monitoring, repair, and maintenance

MAJOR SUB-TASKS
Product 1

- Materials and methods for underwater construction and repair
  - Concrete and grouts (continue material development and include environmental effects)
  - Reusable/recyclable material (e.g. on-site materials)
- Equipment and methods for underwater inspection and monitoring of sites and structures including material properties assessment (both from boat or remote monitoring) equipment investigation (off-the-shelf) and get it into the field)
  - Impact-echo
  - High–resolution acoustic imaging
  - Time Domain Reflectometry (determine bed elevations) (i.e. Needed at entrance channels)
  - Predictive models (for long-term maintenance) – may go with routine underwater inspections

BENEFITS
PRODUCT 1

- Underwater construction and repair capabilties
  - Rapid construction and repair
  - Minimize environmental impact
  - Reduce construction costs
  - Minimize impact on navigation
- Enhanced capabilities for submerged debris detection
- Rapid assessment (i.e. damage assessment after an incident)
- Security (i.e. Norfolk Harbor already investigating many of these technologies

PRIMARY PRODUCT 2

Technology for design, construction, maintenance, and repair of navigation structures

MAJOR SUB-TASKS
Product 2

- Vessel Impact Loadings (ability to handle new container systems - inland, expand impact prediction capabilities for coastal and Great Lake facilities)
  - Loads on walls, gates, and port facilities
  - Loads on connections between barges
- Soil Structure Interaction (SSI) of retaining walls with multiple rows of anchors – complete displacement prediction capabilities for districts, movement based on construction-induced and long-term movements
- Computer modeling
  - Integrated system design analysis – (i.e. Guierrmo Riveros, ITL), definitely in structural design
  - Hydraulics of float-in structures (what are flow conditions when the float-in is coming in)
  - Ice and Debris passage model at navigation projects to look at ice avoidance
  - Wave action on coastal structures

MAJOR SUB-TASKS
Product 2

- Flow training devices during construction (current control to help float-in devices and reduce impacts on navigation)
- High performance materials for rapid repair and replacement
  - Breakwaters
  - Lock wall and gate impacts
  - Life cycle maintenance reduction (composite materials)
- Design and structural performance improvement of lock and spillway gates, and closure structures (I.e. flood protection
  - Addition of redundancy to bulkhead stacks
  - Modular design of lock and spillway gates for rapid replacement (because of accidents or terrorism)
- Decision-making tools for prioritizing structure maintenance and improvements

MAJOR SUB-TASKS
Product 2

- Decision-making tools for prioritizing structure maintenance and improvements
  - Quantitative and objective condition assessment tools
  - Deterioration models (I.e. concrete)
- Effective channel design (deep and shallow draft)
  - Lock approach
  - Entrance channel

BENEFITS
PRODUCT 2

- Alternate construction methods that minimize environmental impacts
- Reduced time/cost for construction, maintenance, and repair
- Rapid return to service following incident (terrorism or other)
- Increased/improved service life performance

PRIMARY PRODUCT 3

Technology for improving transportation operational efficiency

MAJOR SUB-TASKS
Product 3

- Navigation Information Systems
  - Enhanced fog vision
  - Display panel integration
  - Predictive steering
  - Real-time depth and flow information (NOAA already has such a similar system for ports)
  - Portable tow thrusters
  - Ice and Debris conditions
- Guidance for mooring in lock approach during operations (i.e. procedures or better understanding of effect of hydraulic loads translated thru the vessel onto the structure)
- Vessel motion at entrance channels (vessel simulator and other modeling tools)
- Ice/Debris Effects
  - Investigate feasibility of winter long navigation on the upper MS and Great Lakes in light of recent climate trends
  - Ice-shedding or avoidance techniques using power other than electricity (i.e. passive device such as low-adhesion lock wall)
  - Ice/Debris passage and avoidance methods

MAJOR SUB-TASKS
Product 3

- Continuous operations (24-7-365), maintenance, and repair
  - Alternate/backup systems
  - Component standardization
  - Rapid structural repair (including breakwaters, locks, etc.)
- Operational systems
  - Barge connections (lashings)
  - Operational efficiency of mechanical equipment, filling and emtying systems,and gates
- Traffic usage assessment tools
- Operational impact of wave action in ports and harbors

PRODUCT 3 BENEFITS

- Decreased transport times
- Increased system capacity
- Decreased damage to moored vessels and docks

CONNECTIONS

- Infrastructure Technology Program
- Continuing Navigation Program (Sandra's program)
- Other federal agencies (e.g. NOAA, Coast Guard, Navy, DOT)
- Port Authorities

OTHER THOUGHTS/ACTIONS

- Consider cost/benefit considerations of deeper/wider channels (inland?)

- SHOW US THE MONEY!!!